SEQUENCE LISTING

<110> Gish, Kurt C.
       Mack, David H.
       Wilson, Keith E.
       Markowitz, Sanford David

<120> Methods of Detecting Colorectal Cancer

<130> 05882.0179NPUS01

<150> 60/423,960
<151> 2002-11-04

<160> 6

<170> PatentIn version 3.2

<210> 1
<211> 3375
<212> DNA
<213> Homo sapien

<400> 1
gacagtgttc gcggctgcac cgctcggagg ctgggtgacc cgcgtagaag tgaagtactt   60

ttttatttgc agacctgggc cgatgccgct ttaaaaaacg cgaggggctc tatgcacctc   120

cctggcggta gttcctccga cctcagccgg gtcgggtcgt gccgccctct cccaggagag   180

acaaacaggt gtcccacgtg gcagccgcgc cccgggcgcc cctcctgtga tcccgtagcg   240

ccccctggcc cgagccgcgc ccgggtctgt gagtagagcc gcccgggcac cgagcgctgg   300

tcgccgctct ccttccgtta tatcaacatg ccccctttcc tgttgctgga ggccgtctgt   360

gttttcctgt tttccagagt gcccccatct ctccctctcc aggaagtcca tgtaagcaaa   420

gaaaccatcg ggaagatttc agctgccagc aaaatgatgt ggtgctcggc tgcagtggac   480

atcatgtttc tgttagatgg gtctaacagc gtcgggaaag ggagctttga aaggtccaag   540

cactttgcca tcacagtctg tgacggtctg gacatcagcc ccgagagggt cagagtggga   600

gcattccagt tcagttccac tcctcatctg gaattcccct tggattcatt ttcaacccaa   660

caggaagtga aggcaagaat caagaggatg gttttcaaag gagggcgcac ggagacggaa   720

cttgctctga aataccttct gcacagaggg ttgcctggag gcagaaatgc ttctgtgccc   780

cagatcctca tcatcgtcac tgatgggaag tcccaggggg atgtggcact gccatccaag   840

cagctgaagg aaaggggtgt cactgtgttt gctgtggggg tcaggtttcc caggtgggag   900

gagctgcatg cactggccag cgagcctaga gggcagcacg tgctgttggc tgagcaggtg   960

gaggatgcca ccaacggcct cttcagcacc ctcagcagct cggccatctg ctccagcgcc   1020

acgccagact gcagggtcga ggctcacccc tgtgagcaca ggacgctgga gatggtccgg   1080

1

```
gagttcgctg gcaatgcccc atgctggaga ggatcgcggc ggacccttgc ggtgctggct    1140

gcacactgtc ccttctacag ctggaagaga gtgttcctaa cccaccctgc cacctgctac    1200

aggaccacct gcccaggccc ctgtgactcg cagccctgcc agaatggagg cacatgtgtt    1260

ccagaaggac tggacggcta ccagtgcctc tgcccgctgg cctttggagg ggaggctaac    1320

tgtgccctga agctgagcct ggaatgcagg gtcgacctcc tcttcctgct ggacagctct    1380

gcgggcacca ctctggacgg cttcctgcgg gccaaagtct tcgtgaagcg gtttgtgcgg    1440

gccgtgctga gcgaggactc tcgggcccga gtgggtgtgg ccacatacag cagggagctg    1500

ctggtggcgg tgcctgtggg ggagtaccag gatgtgcctg acctggtctg gagcctcgat    1560

ggcattccct tccgtggtgg ccccaccctg acgggcagtg ccttgcggca ggcggcagag    1620

cgtggcttcg ggagcgccac caggacaggc caggaccggc cacgtagagt ggtggttttg    1680

ctcactgagt cacactccga ggatgaggtt gcgggcccag cgcgtcacgc aagggcgcga    1740

gagctgctcc tgctgggtgt aggcagtgag gccgtgcggg cagagctgga ggagatcaca    1800

ggcagcccaa agcatgtgat ggtctactcg gatcctcagg atctgttcaa ccaaatccct    1860

gagctgcagg ggaagctgtg cagccggcag cggccagggt gccggacaca agccctggac    1920

ctcgtcttca tgttggacac ctctgcctca gtagggcccg agaattttgc tcagatgcag    1980

agctttgtga gaagctgtgc cctccagttt gaggtgaacc ctgacgtgac acaggtcggc    2040

ctggtggtgt atggcagcca ggtgcagact gccttcgggc tggacaccaa acccacccgg    2100

gctgcgatgc tgcgggccat tagccaggcc ccctacctag gtgggtggg ctcagccggc    2160

accgccctgc tgcacatcta tgacaaagtg atgaccgtcc agaggggtgc ccggcctggt    2220

gtccccaaag ctgtggtggt gctcacaggc gggagaggcg cagaggatgc agccgttcct    2280

gcccagaagc tgaggaacaa tggcatctct gtcttggtcg tgggcgtggg gcctgtccta    2340

agtgagggtc tgcggaggct tgcaggtccc cgggattccc tgatccacgt ggcagcttac    2400

gccgacctgc ggtaccacca ggacgtgctc attgagtggc tgtgtggaga agccaagcag    2460

ccagtcaacc tctgcaaacc cagcccgtgc atgaatgagg gcagctgcgt cctgcagaat    2520

gggagctacc gctgcaagtg tcgggatggc tgggagggcc cccactgcga gaaccgtgag    2580

tggagctctt gctctgtatg tgtgagccag ggatggattc ttgagacgcc cctgaggcac    2640

atggctcccg tgcaggaggg cagcagccgt acccctccca gcaactacag agaaggcctg    2700

ggcactgaaa tggtgcctac cttctggaat gtctgtgccc caggtcctta gaatgtctgc    2760

ttcccgccgt ggccaggacc actattctca ctgagggagg aggatgtccc aactgcagcc    2820
```

2

```
atgctgctta gagacaagaa agcagctgat gtcacccaca aacgatgttg ttgaaaagtt    2880

ttgatgtgta agtaaatacc cactttctgt acctgctgtg ccttgttgag gctatgtcat    2940

ctgccacctt tcccttgagg ataaacaagg ggtcctgaag acttaaattt agcggcctga    3000

cgttcctttg cacacaatca atgctcgcca gaatgttgtt gacacagtaa tgcccagcag    3060

aggcctttac tagagcatcc tttggacggc gaaggccacg gcctttcaag atggaaagca    3120

gcagcttttc cacttcccca gagacattct ggatgcattt gcattgagtc tgaaaggggg    3180

cttgagggac gtttgtgact tcttggcgac tgccttttgt gtgtggaaga gacttggaaa    3240

ggtctcagac tgaatgtgac caattaacca gcttggttga tgatggggga ggggctgagt    3300

tgtgcatggg cccaggtctg gagggccacg taaaatcgtt ctgagtcgtg agcagtgtcc    3360

accttgaagg tcttc                                                     3375
```

<210> 2
<211> 807
<212> PRT
<213> Homo sapien

<400> 2

```
Met Pro Pro Phe Leu Leu Leu Glu Ala Val Cys Val Phe Leu Phe Ser
1               5                   10                  15

Arg Val Pro Pro Ser Leu Pro Leu Gln Glu Val His Val Ser Lys Glu
                20                  25                  30

Thr Ile Gly Lys Ile Ser Ala Ala Ser Lys Met Met Trp Cys Ser Ala
            35                  40                  45

Ala Val Asp Ile Met Phe Leu Leu Asp Gly Ser Asn Ser Val Gly Lys
        50                  55                  60

Gly Ser Phe Glu Arg Ser Lys His Phe Ala Ile Thr Val Cys Asp Gly
65                  70                  75                  80

Leu Asp Ile Ser Pro Glu Arg Val Arg Val Gly Ala Phe Gln Phe Ser
                85                  90                  95

Ser Thr Pro His Leu Glu Phe Pro Leu Asp Ser Phe Ser Thr Gln Gln
                100                 105                 110

Glu Val Lys Ala Arg Ile Lys Arg Met Val Phe Lys Gly Gly Arg Thr
            115                 120                 125

Glu Thr Glu Leu Ala Leu Lys Tyr Leu Leu His Arg Gly Leu Pro Gly
        130                 135                 140

Gly Arg Asn Ala Ser Val Pro Gln Ile Leu Ile Ile Val Thr Asp Gly
145                 150                 155                 160

Lys Ser Gln Gly Asp Val Ala Leu Pro Ser Lys Gln Leu Lys Glu Arg
                165                 170                 175
```

3

```
Gly Val Thr Val Phe Ala Val Gly Val Arg Phe Pro Arg Trp Glu Glu
        180             185             190

Leu His Ala Leu Ala Ser Glu Pro Arg Gly Gln His Val Leu Leu Ala
        195             200             205

Glu Gln Val Glu Asp Ala Thr Asn Gly Leu Phe Ser Thr Leu Ser Ser
        210             215             220

Ser Ala Ile Cys Ser Ser Ala Thr Pro Asp Cys Arg Val Glu Ala His
225             230             235             240

Pro Cys Glu His Arg Thr Leu Glu Met Val Arg Glu Phe Ala Gly Asn
            245             250             255

Ala Pro Cys Trp Arg Gly Ser Arg Arg Thr Leu Ala Val Leu Ala Ala
            260             265             270

His Cys Pro Phe Tyr Ser Trp Lys Arg Val Phe Leu Thr His Pro Ala
            275             280             285

Thr Cys Tyr Arg Thr Thr Cys Pro Gly Pro Cys Asp Ser Gln Pro Cys
290             295             300

Gln Asn Gly Gly Thr Cys Val Pro Glu Gly Leu Asp Gly Tyr Gln Cys
305             310             315             320

Leu Cys Pro Leu Ala Phe Gly Gly Glu Ala Asn Cys Ala Leu Lys Leu
            325             330             335

Ser Leu Glu Cys Arg Val Asp Leu Leu Phe Leu Leu Asp Ser Ser Ala
            340             345             350

Gly Thr Thr Leu Asp Gly Phe Leu Arg Ala Lys Val Phe Val Lys Arg
        355             360             365

Phe Val Arg Ala Val Leu Ser Glu Asp Ser Arg Ala Arg Val Gly Val
        370             375             380

Ala Thr Tyr Ser Arg Glu Leu Leu Val Ala Val Pro Val Gly Glu Tyr
385             390             395             400

Gln Asp Val Pro Asp Leu Val Trp Ser Leu Asp Gly Ile Pro Phe Arg
            405             410             415

Gly Gly Pro Thr Leu Thr Gly Ser Ala Leu Arg Gln Ala Ala Glu Arg
            420             425             430

Gly Phe Gly Ser Ala Thr Arg Thr Gly Gln Asp Arg Pro Arg Arg Val
            435             440             445

Val Val Leu Leu Thr Glu Ser His Ser Glu Asp Glu Val Ala Gly Pro
        450             455             460

Ala Arg His Ala Arg Ala Arg Glu Leu Leu Leu Leu Gly Val Gly Ser
465             470             475             480

Glu Ala Val Arg Ala Glu Leu Glu Glu Ile Thr Gly Ser Pro Lys His
                            4
```

```
                    485                   490                   495

Val Met Val Tyr Ser Asp Pro Gln Asp Leu Phe Asn Gln Ile Pro Glu
            500                   505                   510

Leu Gln Gly Lys Leu Cys Ser Arg Gln Arg Pro Gly Cys Arg Thr Gln
            515                   520                   525

Ala Leu Asp Leu Val Phe Met Leu Asp Thr Ser Ala Ser Val Gly Pro
    530                   535                   540

Glu Asn Phe Ala Gln Met Gln Ser Phe Val Arg Ser Cys Ala Leu Gln
545                   550                   555                   560

Phe Glu Val Asn Pro Asp Val Thr Gln Val Gly Leu Val Val Tyr Gly
            565                   570                   575

Ser Gln Val Gln Thr Ala Phe Gly Leu Asp Thr Lys Pro Thr Arg Ala
            580                   585                   590

Ala Met Leu Arg Ala Ile Ser Gln Ala Pro Tyr Leu Gly Gly Val Gly
            595                   600                   605

Ser Ala Gly Thr Ala Leu Leu His Ile Tyr Asp Lys Val Met Thr Val
    610                   615                   620

Gln Arg Gly Ala Arg Pro Gly Val Pro Lys Ala Val Val Val Leu Thr
625                   630                   635                   640

Gly Gly Arg Gly Ala Glu Asp Ala Ala Val Pro Ala Gln Lys Leu Arg
            645                   650                   655

Asn Asn Gly Ile Ser Val Leu Val Val Gly Val Gly Pro Val Leu Ser
            660                   665                   670

Glu Gly Leu Arg Arg Leu Ala Gly Pro Arg Asp Ser Leu Ile His Val
            675                   680                   685

Ala Ala Tyr Ala Asp Leu Arg Tyr His Gln Asp Val Leu Ile Glu Trp
    690                   695                   700

Leu Cys Gly Glu Ala Lys Gln Pro Val Asn Leu Cys Lys Pro Ser Pro
705                   710                   715                   720

Cys Met Asn Glu Gly Ser Cys Val Leu Gln Asn Gly Ser Tyr Arg Cys
            725                   730                   735

Lys Cys Arg Asp Gly Trp Glu Gly Pro His Cys Glu Asn Arg Glu Trp
            740                   745                   750

Ser Ser Cys Ser Val Cys Val Ser Gln Gly Trp Ile Leu Glu Thr Pro
            755                   760                   765

Leu Arg His Met Ala Pro Val Gln Glu Gly Ser Ser Arg Thr Pro Pro
    770                   775                   780

Ser Asn Tyr Arg Glu Gly Leu Gly Thr Glu Met Val Pro Thr Phe Trp
785                   790                   795                   800
```

5

Asn Val Cys Ala Pro Gly Pro
                805

<210>   3
<211>   5808
<212>   DNA
<213>   Homo sapien

<400>   3
gctcacccag gaaaaatatg caatcgtccc attgatatac aggccactac aatggatgga   60

gttaacctca gcaccgaggt tgtctacaaa aaaggccagg attataggtt tgcttgctac   120

gaccgggggca gagcctgccg gagctaccgt gtacggttcc tctgtgggaa gcctgtgagg   180

cccaaactca cagtcaccat tgacaccaat gtgaacagca ccattctgaa cttggaggat   240

aatgtacagt catggaaacc tggagatacc ctggtcattg ccagtactga ttactccatg   300

taccaggcag aagagttcca ggtgcttccc tgcagatcct cgcccccaa ccaggtcaaa   360

gtggcaggga aaccaatgta cctgcacatc ggggaggaga tagacggcgt ggacatgcgg   420

gcggaggttg ggcttctgag ccggaacatc atagtgatgg gggagatgga ggacaaatgc   480

taccccctaca gaaaccacat ctgcaatttc tttgacttcg atacctttgg gggccacatc   540

aagtttgctc tgggatttaa ggcagcacac ttggagggca cggagctgaa gcatatggga   600

cagcagctgg tgggtcagta cccgattcac ttccacctgg ccggtgatgt agacgaaagg   660

ggaggttatg acccacccac atacatcagg gacctctcca tccatcatac attctctcgc   720

tgcgtcacag tccatggctc caatggcttg ttgatcaagg acgttgtggg ctataactct   780

ttgggccact gcttcttcac ggaagatggg ccggaggaac gcaacacttt tgaccactgt   840

cttggcctcc ttgtcaagtc tggaaccctc ctcccctcgg accgtgacag caagatgtgc   900

aagatgatca caggagactc ctacccaggg tacatcccca agcccaggca agactgcaat   960

gctgtgtcca ccttctggat ggccaatccc aacaacaacc tcatcaactg tgccgctgca   1020

ggatctgagg aaactggatt ttggtttatt tttcaccacg taccaacggg cccctccgtg   1080

ggaatgtact ccccaggtta ttcagagcac attccactgg gaaaattcta taacaaccga   1140

gcacattcca actaccgggc tggcatgatc atagacaacg gagtcaaaac caccgaggcc   1200

tctgccaagg acaagcggcc gttcctctca atcatctctg ccagatacag ccctcaccag   1260

gacgccgacc cgctgaagcc ccgggagccg gccatcatca gacacttcat tgcctacaag   1320

aaccaggacc acggggcctg gctgcgcggc ggggatgtgt ggctggacag ctgccggttt   1380

gctgacaatg cattggcct gaccctggcc agtggtggaa ccttcccgta tgacgacggc   1440

tccaagcaag agataaagaa cagcttgttt gttggcgaga gtggcaacgt ggggacggaa   1500

6

```
atgatggaca ataggatctg gggccctggc ggcttggacc atagcggaag gaccctccct    1560

ataggccaga attttccaat tagaggaatt cagttatatg atggccccat caacatccaa    1620

aactgcactt tccgaaagtt tgtggccctg gagggccggc acaccagcgc cctggccttc    1680

cgcctgaata atgcctggca gagctgcccc cataacaacg tgaccggcat tgcctttgag    1740

gacgttccga ttacttccag agtgttcttc ggagagcctg gccctggtt caaccagctg     1800

gacatggatg gggataagac atctgtgttc catgacgtcg acggctccgt gtccgagtac    1860

cctggctcct acctcacgaa gaatgacaac tggctggtcc ggcacccaga ctgcatcaat    1920

gttcccgact ggagaggggc catttgcagt gggtgctatg cacagatgta cattcaagcc    1980

tacaagacca gtaacctgcg aatgaagatc atcaagaatg acttccccag ccaccctctt    2040

tacctggagg gggcgctcac caggagcacc cattaccagc aataccaacc ggttgtcacc    2100

ctgcagaagg gctacaccat ccactgggac cagacggccc ccgccgaact cgccatctgg    2160

ctcatcaact tcaacaaggg cgactggatc cgagtggggc tctgctaccc gcgaggcacc    2220

acattctcca tcctctcgga tgttcacaat cgcctgctga agcaaacgtc caagacgggc    2280

gtcttcgtga ggaccttgca gatggacaaa gtggagcaga gctaccctgg caggagccac    2340

tactactggg acgaggactc agggctgttg ttcctgaagc tgaaagctca gaacgagaga    2400

gagaagtttg ctttctgctc catgaaaggc tgtgagagga taaagattaa agctctgatt    2460

ccaaagaacg caggcgtcag tgactgcaca gccacagctt accccaagtt caccgagagg    2520

gctgtcgtag acgtgccgat gcccaagaag ctctttggtt ctcagctgaa aacaaaggac    2580

catttcttgg aggtgaagat ggagagttcc aagcagcact tcttccacct ctggaacgac    2640

ttcgcttaca ttgaagtgga tgggaagaag taccccagtt cggaggatgg catccaggtg    2700

gtggtgattg acgggaacca agggcgcgtg gtgagccaca cgagcttcag gaactccatt    2760

ctgcaaggca taccatggca gcttttcaac tatgtggcga ccatccctga caattccata    2820

gtgcttatgg catcaaaggg aagatacgtc tccagaggcc catggaccag agtgctggaa    2880

aagcttgggg cagacagggg tctcaagttg aaagagcaaa tggcattcgt tggcttcaaa    2940

ggcagcttcc ggcccatctg ggtgacactg gacactgagg atcacaaagc caaaatcttc    3000

caagttgtgc ccatccctgt ggtgaagaag aagaagttgt gaggacagct gccgcccggt    3060

gccacctcgt ggtagactat gacggtgact cttggcagca gaccagtggg ggatggctgg    3120

gtcccccagc ccctgccagc agctgcctgg aaggccgtg tttcagccct gatgggccaa     3180

gggaaggcta tcagagaccc tggtgctgcc acctgcccct actcaagtgt ctacctggag    3240

cccctggggc ggtgctggcc aatgctggaa acattcactt tcctgcagcc tcttgggtgc    3300
```

7

```
ttctctccta tctgtgcctc ttcagtgggg gtttggggac catatcagga gacctgggtt    3360

gtgctgacag caaagatcca ctttggcagg agccctgacc cagctaggag gtagtctgga    3420

gggctggtca ttcacagatc cccatggtct tcagcagaca agtgagggtg gtaaatgtag    3480

gagaaagagc cttggcctta aggaaatctt tactcctgta agcaagagcc aacctcacag    3540

gattaggagc tggggtagaa ctggctatcc ttggggaaga ggcaagccct gcctctggcc    3600

gtgtccacct ttcaggagac tttgagtggc aggtttggac ttggactaga tgactctcaa    3660

aggccctttt agttctgaga ttccagaaat ctgctgcatt tcacatggta cctggaaccc    3720

aacagttcat ggatatccac tgatatccat gatgctgggt gccccagcgc acacgggatg    3780

gagaggtgag aactaatgcc tagcttgagg ggtctgcagt ccagtagggc aggcagtcag    3840

gtccatgtgc actgcaatgc caggtggaga aatcacagag aggtaaaatg gaggccagtg    3900

ccatttcaga ggggaggctc aggaaggctt cttgcttaca ggaatgaagg ctgggggcat    3960

tttgctgggg ggagatgagg cagcctctgg aatggctcag ggattcagcc ctccctgccg    4020

ctgcctgctg aagctggtga ctacggggtc gccctttgct cacgtctctc tggcccactc    4080

atgatggaga agtgtggtca gaggggagca atgggctttg ctgcttatga gcacagagga    4140

attcagtccc caggcagccc tgcctctgac tccaagaggg tgaagtccac agaagtgagc    4200

tcctgcctta gggcctcatt tgctcttcat ccagggaact gagcacaggg ggcctccagg    4260

agaccctaga tgtgctcgta ctccctcggc ctgggatttc agagctggaa atatagaaaa    4320

tatctagccc aaagccttca ttttaacaga tggggaaagt gagcccccaa gatgggaaag    4380

aaccacacag ctaagggagg gcctggggag ccccacccta gcccttgctg ccacaccaca    4440

ttgcctcaac aaccggcccc agagtgccca ggcactcctg aggtagcttc tggaaatggg    4500

gacaagtccc ctcgaaggaa aggaaatgac tagagtagaa tgacagctag cagatctctt    4560

ccctcctgct cccagcgcac acaaacccgc cctccccttg gtgttggcgg tccctgtggc    4620

cttcactttg ttcactacct gtcagcccag cctgggtgca cagtagctgc aactccccat    4680

tggtgctacc tggctctcct gtctctgcag ctctacaggt gaggcccagc agagggagta    4740

gggctcgcca tgtttctggt gagccaattt ggctgatctt gggtgtctga acagctattg    4800

ggtccacccc agtccctttc agctgctgct taatgccctg ctctctccct ggcccacctt    4860

atagagagcc caaagagctc ctgtaagagg gagaactcta tctgtggttt ataatcttgc    4920

acgaggcacc agagtctccc tgggtcttgt gatgaactac atttatcccc tttcctgccc    4980

caaccacaaa ctctttcctt caaagagggc ctgcctggct ccctccaccc aactgcaccc    5040
```

8

```
atgagactcg gtccaagagt ccattccccca ggtgggagcc aactgtcagg gaggtctttc    5100

ccaccaaaca tctttcagct gctgggaggt gaccatagggg ctctgctttt aaagatatgg    5160

ctgcttcaaa ggccagagtc acaggaagga cttcttccag ggagattagt ggtgatggag    5220

aggagagtta aaatgacctc atgtccttct tgtccacggt tttgttgagt tttcactctt    5280

ctaatgcaag ggtctcacac tgtgaaccac ttaggatgtg atcactttca ggtggccagg    5340

aatgttgaat gtctttggct cagttcattt aaaaaagata tctatttgaa agttctcaga    5400

gttgtacata tgtttcacag tacaggatct gtacataaaa gtttctttcc taaaccattc    5460

accaagagcc aatatctagg cattttcttg gtagcacaaa ttttcttatt gcttagaaaa    5520

ttgtcctcct tgttatttct gtttgtaaga cttaagtgag ttaggtcttt aaggaaagca    5580

acgctcctct gaaatgcttg tctttttttct gttgccgaaa tagctggtcc tttttcggga    5640

gttagatgta tagagtgttt gtatgtaaac atttcttgta ggcatcacca tgaacaaaga    5700

tatattttct atttatttat tatatgtgca cttcaagaag tcactgtcag agaaataaag    5760

aattgtctta aatgtcaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaa                  5808
```

```
<210>   4
<211>   996
<212>   PRT
<213>   Homo sapien

<400>   4

Met Asp Gly Val Asn Leu Ser Thr Glu Val Val Tyr Lys Lys Gly Gln
1               5                   10                  15

Asp Tyr Arg Phe Ala Cys Tyr Asp Arg Gly Arg Ala Cys Arg Ser Tyr
            20                  25                  30

Arg Val Arg Phe Leu Cys Gly Lys Pro Val Arg Pro Lys Leu Thr Val
        35                  40                  45

Thr Ile Asp Thr Asn Val Asn Ser Thr Ile Leu Asn Leu Glu Asp Asn
    50                  55                  60

Val Gln Ser Trp Lys Pro Gly Asp Thr Leu Val Ile Ala Ser Thr Asp
65                  70                  75                  80

Tyr Ser Met Tyr Gln Ala Glu Glu Phe Gln Val Leu Pro Cys Arg Ser
                85                  90                  95

Cys Ala Pro Asn Gln Val Lys Val Ala Gly Lys Pro Met Tyr Leu His
                100                 105                 110

Ile Gly Glu Glu Ile Asp Gly Val Asp Met Arg Ala Glu Val Gly Leu
            115                 120                 125

Leu Ser Arg Asn Ile Ile Val Met Gly Glu Met Glu Asp Lys Cys Tyr
    130                 135                 140
```

9

```
Pro Tyr Arg Asn His Ile Cys Asn Phe Phe Asp Phe Asp Thr Phe Gly
145             150             155             160

Gly His Ile Lys Phe Ala Leu Gly Phe Lys Ala Ala His Leu Glu Gly
                165             170             175

Thr Glu Leu Lys His Met Gly Gln Gln Leu Val Gly Gln Tyr Pro Ile
            180             185             190

His Phe His Leu Ala Gly Asp Val Asp Glu Arg Gly Gly Tyr Asp Pro
            195             200             205

Pro Thr Tyr Ile Arg Asp Leu Ser Ile His His Thr Phe Ser Arg Cys
    210             215             220

Val Thr Val His Gly Ser Asn Gly Leu Leu Ile Lys Asp Val Val Gly
225             230             235             240

Tyr Asn Ser Leu Gly His Cys Phe Phe Thr Glu Asp Gly Pro Glu Glu
            245             250             255

Arg Asn Thr Phe Asp His Cys Leu Gly Leu Leu Val Lys Ser Gly Thr
            260             265             270

Leu Leu Pro Ser Asp Arg Asp Ser Lys Met Cys Lys Met Ile Thr Gly
        275             280             285

Asp Ser Tyr Pro Gly Tyr Ile Pro Lys Pro Arg Gln Asp Cys Asn Ala
    290             295             300

Val Ser Thr Phe Trp Met Ala Asn Pro Asn Asn Asn Leu Ile Asn Cys
305             310             315             320

Ala Ala Ala Gly Ser Glu Glu Thr Gly Phe Trp Phe Ile Phe His His
            325             330             335

Val Pro Thr Gly Pro Ser Val Gly Met Tyr Ser Pro Gly Tyr Ser Glu
            340             345             350

His Ile Pro Leu Gly Lys Phe Tyr Asn Asn Arg Ala His Ser Asn Tyr
        355             360             365

Arg Ala Gly Met Ile Ile Asp Asn Gly Val Lys Thr Thr Glu Ala Ser
    370             375             380

Ala Lys Asp Lys Arg Pro Phe Leu Ser Ile Ile Ser Ala Arg Tyr Ser
385             390             395             400

Pro His Gln Asp Ala Asp Pro Leu Lys Pro Arg Glu Pro Ala Ile Ile
            405             410             415

Arg His Phe Ile Ala Tyr Lys Asn Gln Asp His Gly Ala Trp Leu Arg
            420             425             430

Gly Gly Asp Val Trp Leu Asp Ser Cys Arg Phe Ala Asp Asn Gly Ile
        435             440             445

Gly Leu Thr Leu Ala Ser Gly Gly Thr Phe Pro Tyr Asp Asp Gly Ser
```

10

```
            450                    455                    460

Lys Gln Glu Ile Lys Asn Ser Leu Phe Val Gly Glu Ser Gly Asn Val
465             470             475                    480

Gly Thr Glu Met Met Asp Asn Arg Ile Trp Gly Pro Gly Gly Leu Asp
            485             490                    495

His Ser Gly Arg Thr Leu Pro Ile Gly Gln Asn Phe Pro Ile Arg Gly
        500             505             510

Ile Gln Leu Tyr Asp Gly Pro Ile Asn Ile Gln Asn Cys Thr Phe Arg
        515             520             525

Lys Phe Val Ala Leu Glu Gly Arg His Thr Ser Ala Leu Ala Phe Arg
    530             535             540

Leu Asn Asn Ala Trp Gln Ser Cys Pro His Asn Asn Val Thr Gly Ile
545             550             555             560

Ala Phe Glu Asp Val Pro Ile Thr Ser Arg Val Phe Phe Gly Glu Pro
            565             570             575

Gly Pro Trp Phe Asn Gln Leu Asp Met Asp Gly Asp Lys Thr Ser Val
        580             585             590

Phe His Asp Val Asp Gly Ser Val Ser Glu Tyr Pro Gly Ser Tyr Leu
    595             600             605

Thr Lys Asn Asp Asn Trp Leu Val Arg His Pro Asp Cys Ile Asn Val
    610             615             620

Pro Asp Trp Arg Gly Ala Ile Cys Ser Gly Cys Tyr Ala Gln Met Tyr
625             630             635             640

Ile Gln Ala Tyr Lys Thr Ser Asn Leu Arg Met Lys Ile Ile Lys Asn
            645             650             655

Asp Phe Pro Ser His Pro Leu Tyr Leu Glu Gly Ala Leu Thr Arg Ser
        660             665             670

Thr His Tyr Gln Gln Tyr Gln Pro Val Val Thr Leu Gln Lys Gly Tyr
    675             680             685

Thr Ile His Trp Asp Gln Thr Ala Pro Ala Glu Leu Ala Ile Trp Leu
    690             695             700

Ile Asn Phe Asn Lys Gly Asp Trp Ile Arg Val Gly Leu Cys Tyr Pro
705             710             715             720

Arg Gly Thr Thr Phe Ser Ile Leu Ser Asp Val His Asn Arg Leu Leu
            725             730             735

Lys Gln Thr Ser Lys Thr Gly Val Phe Val Arg Thr Leu Gln Met Asp
            740             745             750

Lys Val Glu Gln Ser Tyr Pro Gly Arg Ser His Tyr Tyr Trp Asp Glu
        755             760             765
```

11

```
Asp Ser Gly Leu Leu Phe Leu Lys Leu Lys Ala Gln Asn Glu Arg Glu
    770             775             780
Lys Phe Ala Phe Cys Ser Met Lys Gly Cys Glu Arg Ile Lys Ile Lys
785             790             795             800
Ala Leu Ile Pro Lys Asn Ala Gly Val Ser Asp Cys Thr Ala Thr Ala
            805             810             815
Tyr Pro Lys Phe Thr Glu Arg Ala Val Val Asp Val Pro Met Pro Lys
            820             825             830
Lys Leu Phe Gly Ser Gln Leu Lys Thr Lys Asp His Phe Leu Glu Val
            835             840             845
Lys Met Glu Ser Ser Lys Gln His Phe Phe His Leu Trp Asn Asp Phe
    850             855             860
Ala Tyr Ile Glu Val Asp Gly Lys Lys Tyr Pro Ser Ser Glu Asp Gly
865             870             875             880
Ile Gln Val Val Val Ile Asp Gly Asn Gln Gly Arg Val Val Ser His
            885             890             895
Thr Ser Phe Arg Asn Ser Ile Leu Gln Gly Ile Pro Trp Gln Leu Phe
            900             905             910
Asn Tyr Val Ala Thr Ile Pro Asp Asn Ser Ile Val Leu Met Ala Ser
    915             920             925
Lys Gly Arg Tyr Val Ser Arg Gly Pro Trp Thr Arg Val Leu Glu Lys
    930             935             940
Leu Gly Ala Asp Arg Gly Leu Lys Leu Lys Glu Gln Met Ala Phe Val
945             950             955             960
Gly Phe Lys Gly Ser Phe Arg Pro Ile Trp Val Thr Leu Asp Thr Glu
            965             970             975
Asp His Lys Ala Lys Ile Phe Gln Val Val Pro Ile Pro Val Val Lys
            980             985             990
Lys Lys Lys Leu
        995

<210>   5
<211>   4702
<212>   DNA
<213>   Homo sapien

<400>   5
gagctagcgc tcaagcagag cccagcgcgg tgctatcgga cagagcctgg cgagcgcaag      60

cggcgcgggg agccagcggg gctgagcgcg gccagggtct gaacccagat ttcccagact     120

agctaccact ccgcttgccc acgccccggg agctcgcggc gcctggcggt cagcgaccag     180

acgtccgggg ccgctgcgct cctggcccgc gaggcgtgac actgtctcgg ctacagaccc     240
```

12

```
agagggagca cactgccagg atgggagctg ctgggaggca ggacttcctc ttcaaggcca     300

tgctgaccat cagctggctc actctgacct gcttccctgg ggccacatcc acagtggctg     360

ctgggtgccc tgaccagagc cctgagttgc aaccctggaa ccctggccat gaccaagacc     420

accatgtgca tatcggccag ggcaagacac tgctgctcac ctcttctgcc acggtctatt     480

ccatccacat ctcagaggga ggcaagctgg tcattaaaga ccacgacgag ccgattgttt     540

tgcgaacccg gcacatcctg attgacaacg gaggagagct gcatgctggg agtgccctct     600

gccctttcca gggcaatttc accatcattt tgtatggaag ggctgatgaa ggtattcagc     660

cggatcctta ctatggtctg aagtacattg gggttggtaa aggaggcgct cttgagttgc     720

atggacagaa aaagctctcc tggacatttc tgaacaagac ccttcaccca ggtggcatgg     780

cagaaggagg ctattttttt gaaaggagct ggggccaccg tggagttatt gttcatgtca     840

tcgaccccaa atcaggcaca gtcatccatt ctgaccggtt tgacacctat agatccaaga     900

aagagagtga acgtctggtc cagtatttga acgcggtgcc cgatggcagg atcctttctg     960

ttgcagtgaa tgatgaaggt tctcgaaatc tggatgacat ggccaggaag gcgatgacca    1020

aattgggaag caaacacttc ctgcaccttg gatttagaca cccttggagt tttctaactg    1080

tgaaaggaaa tccatcatct tcagtggaag accatattga atatcatgga catcgaggct    1140

ctgctgctgc ccgggtattc aaattgttcc agacagagca tggcgaatat ttcaatgttt    1200

ctttgtccag tgagtgggtt caagacgtgg agtggacgga gtggttcgat catgataaag    1260

tatctcagac taaaggtggg gagaaaattt cagacctctg gaaagctcac ccaggaaaaa    1320

tatgcaatcg tcccattgat atacaggcca ctacaatgga tggagttaac ctcagcaccg    1380

aggttgtcta caaaaaaggc caggattata ggtttgcttg ctacgaccgg ggcagagcct    1440

gccggagcta ccgtgtacgg ttcctctgtg ggaagcctgt gaggcccaaa ctcacagtca    1500

ccattgacac caatgtgaac agcaccattc tgaacttgga ggataatgta cagtcatgga    1560

aacctggaga taccctggtc attgccagta ctgattactc catgtaccag gcagaagagt    1620

tccaggtgct tccctgcaga tcctgcgccc ccaaccaggt caaagtggca gggaaaccaa    1680

tgtacctgca catcggggag gagatagacg gcgtggacat gcgggcggag gttgggcttc    1740

tgagccggaa catcatagtg atggggggaga tggaggacaa atgctacccc tacagaaacc    1800

acatctgcaa tttctttgac ttcgatacct ttggggggcca catcaagttt gctctgggat    1860

ttaaggcagc acacttggag ggcacggagc tgaagcatat gggacagcag ctggtgggtc    1920

agtacccgat tcacttccac ctggccggtg atgtagacga aaggggaggt tatgacccac    1980

ccacatacat cagggacctc tccatccatc atacattctc tcgctgcgtc acagtccatg    2040
```

13

```
gctccaatgg cttgttgatc aaggacgttg tgggctataa ctctttgggc cactgcttct   2100

tcacggaaga tgggccggag gaacgcaaca cttttgacca ctgtcttggc ctccttgtca   2160

agtctggaac cctcctcccc tcggaccgtg acagcaagat gtgcaagatg atcacagagg   2220

actcctaccc agggtacatc cccaagccca ggcaagactg caatgctgtg tccaccttct   2280

ggatggccaa tcccaacaac aacctcatca actgtgccgc tgcaggatct gaggaaactg   2340

gattttggtt tattttttcac cacgtaccaa cgggcccctc cgtgggaatg tactccccag   2400

gttattcaga gcacattcca ctgggaaaat tctataacaa ccgagcacat tccaactacc   2460

gggctggcat gatcatagac aacggagtca aaaccaccga ggcctctgcc aaggacaagc   2520

ggccgttcct ctcaatcatc tctgccagat acagccctca ccaggacgcc gacccgctga   2580

agccccggga gccggccatc atcagacact tcattgccta caagaaccag gaccacgggg   2640

cctggctgcg cggcgggat gtgtggctgg acagctgcca tttcagaggg gaggctcagg   2700

aaggcttctt gcttacagga atgaaggctg ggggcatttt gctggggga gatgaggcag   2760

cctctggaat ggctcaggga ttcagccctc cctgccgctg cctgctgaag ctggtgacta   2820

cggggtcgcc ctttgctcac gtctctctgg cccactcatg atggagaagt gtggtcagag   2880

gggagcaatg ggctttgctg cttatgagca cagaggaatt cagtccccag gcagccctgc   2940

ctctgactcc aagagggtga agtccacaga agtgagctcc tgccttaggg cctcatttgc   3000

tcttcatcca gggaactgag cacaggggc ctccaggaga ccctagatgt gctcgtactc   3060

cctcggcctg ggatttcaga gctggaaata tagaaaatat ctagcccaaa gccttcattt   3120

taacagatgg ggaaagtgag cccccaagat gggaagaac cacacagcta agggagggcc   3180

tggggagccc caccctagcc cttgctgcca caccacattg cctcaacaac cggccccaga   3240

gtgcccaggc actcctgagg tagcttctgg aaatggggac aagtcccctc gaaggaaagg   3300

aaatgactag agtagaatga cagctagcag atctcttccc tcctgctccc agcgcacaca   3360

aacccgccct ccccttggtg ttggcggtcc ctgtggcctt cactttgttc actacctgtc   3420

agcccagcct gggtgcacag tagctgcaac tccccattgg tgctacctgg ctctcctgtc   3480

tctgcagctc tacaggtgag gcccagcaga gggagtaggg ctcgccatgt ttctggtgag   3540

ccaatttggc tgatcttggg tgtctgaaca gctattgggt ccaccccagt ccctttcagc   3600

tgctgcttaa tgccctgctc tctccctggc ccaccttata gagagcccaa agagctcctg   3660

taagagggag aactctatct gtggtttata atcttgcacg aggcaccaga gtctccctgg   3720

gtcttgtgat gaactacatt tatccccttt cctgccccaa ccacaaactc tttccttcaa   3780
```

14

```
agagggcctg cctggctccc tccacccaac tgcacccatg agactcggtc caagagtcca    3840

ttccccaggt gggagccaac tgtcagggag gtctttccca ccaaacatct ttcagctgct    3900

gggaggtgac cataggcctc tgcttttaaa gatatggctg cttcaaaggc cagagtcaca    3960

ggaaggactt cttccaggga gattagtggt gatggagagg agagttaaaa tgacctcatg    4020

tccttcttgt ccacggtttt gttgagtttt cactcttcta atgcaagggt ctcacactgt    4080

gaaccactta ggatgtgatc actttcaggt ggccaggaat gttgaatgtc tttggctcag    4140

ttcatttaaa aaagatatct atttgaaagt tctcagagtt gtacatatgt ttcacagtac    4200

aggatctgta cataaaagtt tctttcctaa accattcacc aagagccaat atctaggcat    4260

tttcttggta gcacaaattt tcttattgct tagaaaattg tcctccttgt tatttctgtt    4320

tgtaagactt aagtgagtta ggtctttaag gaaagcaacg ctcctctgaa atgcttgtct    4380

tttttctgtt gccgaaatag ctggtccttt ttcgggagtt agatgtatag agtgtttgta    4440

tgtaaacatt tcttgtaggc atcaccatga acaaagatat attttctatt tatttattat    4500

atgtgcactt caagaagtca ctgtcagaga aataaagaat tgtcttaaat gtcatgattg    4560

gagatgtcct ttgcattgct tggaaggggt gtacctagag ccaaggaaat tggctctggt    4620

ttggaaaaat tttgctgtta ttatagtaaa catacaaagg atgtcaaaaa aaaaaaaaaa    4680

aaaaaaaaaa aaaaaaaaaa aa                                           4702
```

<210> 6
<211> 866
<212> PRT
<213> Homo sapien

<400> 6

```
Met Gly Ala Ala Gly Arg Gln Asp Phe Leu Phe Lys Ala Met Leu Thr
1               5                   10                  15

Ile Ser Trp Leu Thr Leu Thr Cys Phe Pro Gly Ala Thr Ser Thr Val
            20                  25                  30

Ala Ala Gly Cys Pro Asp Gln Ser Pro Glu Leu Gln Pro Trp Asn Pro
            35                  40                  45

Gly His Asp Gln Asp His His Val His Ile Gly Gln Gly Lys Thr Leu
        50                  55                  60

Leu Leu Thr Ser Ser Ala Thr Val Tyr Ser Ile His Ile Ser Glu Gly
65                  70                  75                  80

Gly Lys Leu Val Ile Lys Asp His Asp Glu Pro Ile Val Leu Arg Thr
                85                  90                  95

Arg His Ile Leu Ile Asp Asn Gly Gly Glu Leu His Ala Gly Ser Ala
            100                 105                 110
```

```
Leu Cys Pro Phe Gln Gly Asn Phe Thr Ile Ile Leu Tyr Gly Arg Ala
        115                 120                 125

Asp Glu Gly Ile Gln Pro Asp Pro Tyr Tyr Gly Leu Lys Tyr Ile Gly
        130                 135                 140

Val Gly Lys Gly Gly Ala Leu Glu Leu His Gly Gln Lys Lys Leu Ser
145                 150                 155                 160

Trp Thr Phe Leu Asn Lys Thr Leu His Pro Gly Gly Met Ala Glu Gly
                165                 170                 175

Gly Tyr Phe Phe Glu Arg Ser Trp Gly His Arg Gly Val Ile Val His
                180                 185                 190

Val Ile Asp Pro Lys Ser Gly Thr Val Ile His Ser Asp Arg Phe Asp
        195                 200                 205

Thr Tyr Arg Ser Lys Lys Glu Ser Glu Arg Leu Val Gln Tyr Leu Asn
        210                 215                 220

Ala Val Pro Asp Gly Arg Ile Leu Ser Val Ala Val Asn Asp Glu Gly
225                 230                 235                 240

Ser Arg Asn Leu Asp Asp Met Ala Arg Lys Ala Met Thr Lys Leu Gly
                245                 250                 255

Ser Lys His Phe Leu His Leu Gly Phe Arg His Pro Trp Ser Phe Leu
                260                 265                 270

Thr Val Lys Gly Asn Pro Ser Ser Val Glu Asp His Ile Glu Tyr
        275                 280                 285

His Gly His Arg Gly Ser Ala Ala Ala Arg Val Phe Lys Leu Phe Gln
        290                 295                 300

Thr Glu His Gly Glu Tyr Phe Asn Val Ser Leu Ser Ser Glu Trp Val
305                 310                 315                 320

Gln Asp Val Glu Trp Thr Glu Trp Phe Asp His Asp Lys Val Ser Gln
                325                 330                 335

Thr Lys Gly Gly Glu Lys Ile Ser Asp Leu Trp Lys Ala His Pro Gly
                340                 345                 350

Lys Ile Cys Asn Arg Pro Ile Asp Ile Gln Ala Thr Thr Met Asp Gly
        355                 360                 365

Val Asn Leu Ser Thr Glu Val Val Tyr Lys Lys Gly Gln Asp Tyr Arg
        370                 375                 380

Phe Ala Cys Tyr Asp Arg Gly Arg Ala Cys Arg Ser Tyr Arg Val Arg
385                 390                 395                 400

Phe Leu Cys Gly Lys Pro Val Arg Pro Lys Leu Thr Val Thr Ile Asp
                405                 410                 415

Thr Asn Val Asn Ser Thr Ile Leu Asn Leu Glu Asp Asn Val Gln Ser
```

16

Trp Lys Pro Gly Asp Thr Leu Val Ile Ala Ser Thr Asp Tyr Ser Met
     435   440   445

Tyr Gln Ala Glu Glu Phe Gln Val Leu Pro Cys Arg Ser Cys Ala Pro
     450   455   460

Asn Gln Val Lys Val Ala Gly Lys Pro Met Tyr Leu His Ile Gly Glu
465   470   475   480

Glu Ile Asp Gly Val Asp Met Arg Ala Glu Val Gly Leu Leu Ser Arg
          485   490   495

Asn Ile Ile Val Met Gly Glu Met Glu Asp Lys Cys Tyr Pro Tyr Arg
          500   505   510

Asn His Ile Cys Asn Phe Phe Asp Phe Asp Thr Phe Gly Gly His Ile
          515   520   525

Lys Phe Ala Leu Gly Phe Lys Ala Ala His Leu Glu Gly Thr Glu Leu
          530   535   540

Lys His Met Gly Gln Gln Leu Val Gly Gln Tyr Pro Ile His Phe His
545   550   555   560

Leu Ala Gly Asp Val Asp Glu Arg Gly Gly Tyr Asp Pro Pro Thr Tyr
          565   570   575

Ile Arg Asp Leu Ser Ile His His Thr Phe Ser Arg Cys Val Thr Val
          580   585   590

His Gly Ser Asn Gly Leu Leu Ile Lys Asp Val Val Gly Tyr Asn Ser
          595   600   605

Leu Gly His Cys Phe Phe Thr Glu Asp Gly Pro Glu Glu Arg Asn Thr
          610   615   620

Phe Asp His Cys Leu Gly Leu Leu Val Lys Ser Gly Thr Leu Leu Pro
625   630   635   640

Ser Asp Arg Asp Ser Lys Met Cys Lys Met Ile Thr Glu Asp Ser Tyr
          645   650   655

Pro Gly Tyr Ile Pro Lys Pro Arg Gln Asp Cys Asn Ala Val Ser Thr
          660   665   670

Phe Trp Met Ala Asn Pro Asn Asn Asn Leu Ile Asn Cys Ala Ala Ala
          675   680   685

Gly Ser Glu Glu Thr Gly Phe Trp Phe Ile Phe His His Val Pro Thr
          690   695   700

Gly Pro Ser Val Gly Met Tyr Ser Pro Gly Tyr Ser Glu His Ile Pro
705   710   715   720

Leu Gly Lys Phe Tyr Asn Asn Arg Ala His Ser Asn Tyr Arg Ala Gly
          725   730   735

```
Met Ile Ile Asp Asn Gly Val Lys Thr Thr Glu Ala Ser Ala Lys Asp
            740             745             750

Lys Arg Pro Phe Leu Ser Ile Ile Ser Ala Arg Tyr Ser Pro His Gln
        755             760             765

Asp Ala Asp Pro Leu Lys Pro Arg Glu Pro Ala Ile Ile Arg His Phe
    770             775             780

Ile Ala Tyr Lys Asn Gln Asp His Gly Ala Trp Leu Arg Gly Gly Asp
785             790             795             800

Val Trp Leu Asp Ser Cys His Phe Arg Gly Glu Ala Gln Glu Gly Phe
            805             810             815

Leu Leu Thr Gly Met Lys Ala Gly Gly Ile Leu Leu Gly Gly Asp Glu
            820             825             830

Ala Ala Ser Gly Met Ala Gln Gly Phe Ser Pro Pro Cys Arg Cys Leu
            835             840             845

Leu Lys Leu Val Thr Thr Gly Ser Pro Phe Ala His Val Ser Leu Ala
    850             855             860

His Ser
865
```